

Loving Your Bones

Strengthen and build your amazing, dynamic support system!

by Michael Klaper, M.D.



Perhaps nothing tells us more about the state of our overall health than the vitality and strength of our bones. Rather than being inert rods of calcium, as some people conceive, our bones are gloriously alive, with a rich blood supply and an intricate nerve network; and like muscles, they respond, slowly but surely, to the physical stresses we place upon them.

How are they able to do that? Nestled within the honey-combed matrix of the bone structure are cells called osteoblasts. (“osteo” = bone; “blasto” = germination) When the owner of the bones carries a heavy object, climbs stairs, or uses resistance bands, the bone structure is subjected to subtle, but strong, physical forces that want to bend and twist the bone. Those forces don’t actually twist the bone, but they do generate electrical and chemical signals within the bone to prompt the osteoblasts to spin out a protein called osteoid. The protein units of osteoid are assembled into a latticework of scaffolding, which the body then calcifies—and, voila, we have the formation of strong bone.

The bones remain dynamically alive with a network of arteries bringing blood and nutrients to the osteoblasts, but the bone also harbors large cells called osteoclasts (“clasto” = breaker) that dissolve bone structure. Why would we want cells that break down bone material? Because life is a contact sport, and every time you bang your shin against the coffee table or hit your elbow against the nightstand, tiny microcracks can appear in the bone. If not promptly repaired, like a crack in a car windshield, the microfracture will extend through the bone, opening the door to a full fracture with the next fall or lift.

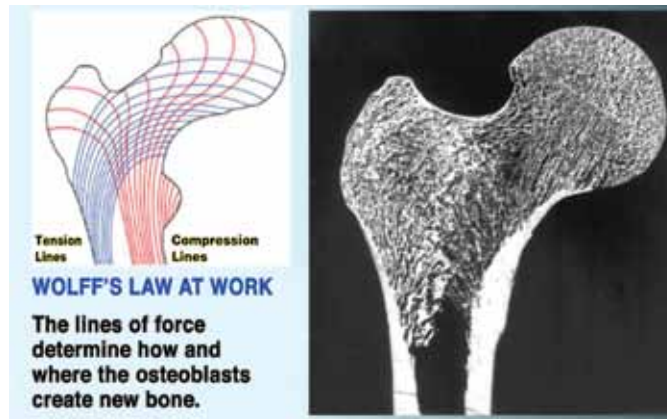
The injured bone cells at the site of the new microfracture send out signaling proteins which summon in the osteoclast cells. Like a demolition crew clearing out old building structures before the osteoblast “construction crew” moves in, the osteoclasts release their protein-dissolving enzymes, and the site of the injured bone is liquified and resorbed. The site is now ready for the osteoblasts to lay down new bone struc-

ture. Some repair crew—talk about the wisdom of the body!

As the bones are used for physical work, like lifting objects, climbing stairs, etc., the lines of physical force that run down the shaft of the bone, like those shown in the following figures, are the lines along which the osteoblasts will spin out their bone fibers. In what has become known as “Wolff’s Law,” German physician and physiologist Dr. Julian Wolff wrote that “bone in a healthy person or animal will

adapt to the loads under which it is placed.” You can see Wolff’s Law at work in the lines of the bone structure on the x-ray of the hip at left.

Wolff’s law is demonstrated again in the arm bone density of professional tennis players, which predictably is greater on the serving arm than on the nondominant arm.¹ The process is called remodeling, and it really is one of the wonders of our



body.

So, bones responding to the stresses placed upon them by getting stronger is quite analogous to muscles hypertrophying and becoming bigger and stronger as we use them. Unfortunately, remodeling also works in reverse. The osteoclasts never sleep. If we become sedentary, either by choosing to become a “couch potato” or by being forced to by injury or illness, if we sit and lay far more than we move and lift, the bone matrix begins to weaken and dissolve. Boney buttresses melt away, unused bone gets dismantled and weight-bearing bones effectively turn into styrofoam. The telltale signs of porous bones show up on x-rays and bone scans and the diagnosis of osteoporosis is made.

We now know that drinking milk or taking calcium tablets will not reverse this process. Although the dairy industry and the supplement makers may want us to believe that the fundamental problem in osteoporosis is low calcium intake, the real destructive process driving the loss of bone structure is disuse atrophy of the bones. The entire bone matrix is dissolving due to lack of use—no wonder taking calcium tablets or drinking the milk of a cow won’t magically reverse it!

Fortunately, osteoporosis is a reversible disease. The osteoblasts, though reduced in numbers, are still in the bones,

waiting to be asked to spin out new osteoid. Low bone density on a DEXA scan is a special delivery message from your bones to you, saying, “Use us or lose us!”

All our bones are asking us to do is to stop kidding ourselves about our sedentary lifestyle and start using these miraculous bones and muscles like nature intended! The truly effective treatment to prevent or reverse osteoporosis lies not in a pill, but rather in your walking shoes.

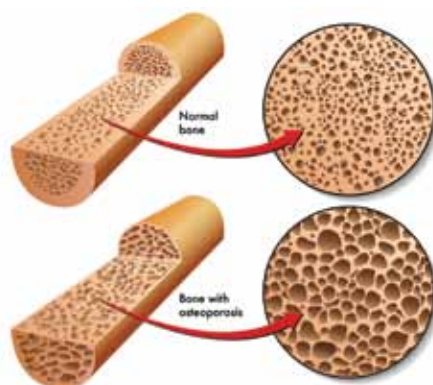
Find some activity that puts some gravitational stress on your bones. There are convenient (some even fun) ways to do this. When Reinhold Meissner, the first man to summit Mt. Everest without using oxygen, was asked how the average person could keep their bones strong, he said, “Never miss a chance to walk up stairs!”—and he was right. Never miss a chance to carry packages, to carefully carry weighty objects, and to take long walks, preferably with a light backpack or other device, like a 6-lb. or 8-lb. weighted vest. Inexpensive weighted vests can be purchased online and worn during the day under a shirt.

If, every other day, you slip on a light weighted vest, grab a couple of 3-lb. or 5-lb. hand weights and go out for a 20- to 30-minute walk, you will give your bones the workout that tells them you love them. Every step with the slight burden of weight stresses the bone structure ever so slightly and tells the osteoblasts to “Wake up!” and “Make new bone!”—and they will listen! Studies clearly show that gentle weight-bearing exercise is the best, cheapest, and safest way to reverse osteoporosis.² The best exercise of all? The one you will actually do! Pick your favorite from this list:

- Dancing
- Hiking
- Jumping rope
- Tennis
- Resistance bands
- High-impact aerobics
- Jogging/running
- Stair climbing
- Weight lifting

Although exercises against gravity are especially potent in helping bones stay strong, muscle contraction of any kind will help generate electrical currents that help stimulate the osteoblast cells that lay down new bone structure. Elastic, stretchable bands that can be used in resistance training, even while a person is sitting, are also excellent tools to provide muscular exercise that will help keep bones strong.

Osteoporosis is not an inevitable part of growing older. Nature would not supply us with a heart and blood vessel



system made to function for over 100 years while giving us bones destined to fall apart at age 60! Bones are supposed to last as long as all the rest of our organs, at least to the 100-year mark—and beyond. Rather than being a normal part of aging, osteoporosis is a reversible disease state characterized by dissolution of the bone structure. This is an important concept.

Unfortunately, today most of us do very little manual labor. Machines

carry our loads—and even carry most of us—everywhere, so we are free to sit for most of our day. This is a very effective way to let the calcium drain out of our bones. As we look around the globe, we see that in countries where people spend their entire long lives physically active, their bones stay strong. In these nations, the disease of osteoporosis is rare.

A dramatic demonstration of the opposite situation is seen in the astronauts, who spend relatively few days in gravity-free environments, and yet suffer severe loss of calcium from their bones. Fortunately, the calcium is restored to the skeleton in a relatively short time when the astronaut is back in a normal-gravity environment.

This is an important, and hopeful, clue for the rest of us, evidence that the osteoporotic process can be reversed.

To keep your bones healthy and to prevent osteoporosis, the most important thing you can do is to stay as physically active as you can throughout your life. Since calcium is always being laid down

in the skeleton, it is never too late to begin to strengthen the bones. Medical studies have shown that, even in elderly people, osteoporotic bones can be made stronger by gentle but steady exercise, like walking up stairs or squeezing rubber balls.³ Such is the power of using our muscles: it actually helps pull calcium into the bones and keep it there, keeping our skeleton strong.

Now that we understand that our ever-more-sedentary desk jobs and lifestyles are the chief cause of the osteoporosis epidemic that is ravaging virtually all industrialized societies, we’ll look at the other major calcium thieves that attack our bones, namely, those hiding in things that we ingest. Let’s see how a moment of pleasure to entertain the tongue can rob precious calcium from the bones and weaken our very skeleton.

The calcium thieves that gain oral entrance into our body commonly include:

- Sugar, when eaten as a food (as in cakes and candies), can make the kidneys urinate out calcium.⁴

- Phosphoric acid, a common ingredient in cola drinks that gives the cola its “bite,” can be a calcium thief.⁵
- Caffeine in coffee, tea, or cola drinks, when consumed in large amounts (over 300 mg per day). That would be between 2 and 3 cups of strong coffee daily.⁶
- Cigarette smoke.⁷ Smokers seem to be at higher risk for osteoporosis.

Well, there you have the recipe for osteoporosis:

be a woman (women start with less calcium in their bones than men), work at a sedentary desk job, sip all day on your diet cola, smoke your cigarettes, and do as little physical exercise as you possibly can. This is a sure way to hasten your trip to a fractured hip—a predictable, but fortunately, avoidable, course.

Dairy Reconsidered

For people who dutifully drink milk and swallow cheese, ice cream, and yogurt believing that the magic of cow’s milk will ward off fractures in old age, be advised that there is very little evidence that dairy products prevent osteoporosis; in fact, just the opposite may be true. Surprisingly, the nations who consume the most dairy products—the United States, Israel, the Netherlands, and Scandinavian countries—suffer the highest incidences of osteoporosis.⁸ If dairy products actually prevented osteoporosis, it would be rare in America and these other countries, yet it is actually more rampant in these nations than in less developed countries.

Conversely, most humans on our planet, in Asia, South America, and Africa, virtually never consume cow’s milk products; the milk, transportation, and refrigeration simply are not available. Yet, osteoporosis is not a common condition in these countries. Most of these people, barring starvation or parasitic diseases, enjoy strong bones throughout their physically active lives, deriving essentially all their calcium from green vegetables, seeds, grains, and from their drinking water.

Incidentally, seeing cow’s milk and dairy products as far from essential for bone health can be advantageous for the rest of your body. Cow’s milk contains proteins and other

THIS FOOD DOES NOT NOURISH HEALTHY BONES!



substances that are thought to play a major role in many serious diseases, like asthma, rheumatoid arthritis, recurring ear infections, eczema, colitis, and various autoimmune diseases.

Don’t be surprised if, after a few weeks without dairy products, your body feels and functions better in many ways: less swallowed phlegm, intestinal gas, runny nasal secretions, and other common, milk-related symptoms. Fortunately, these days going dairy-free

is no great hardship. It is easy to find nondairy replacements for milk, yogurt, ice cream, cheese, and other cow’s-milk-based products—just check in the refrigerator and freezer cases of your local natural food store or supermarket.

Supplements and Other Strategies

Although calcium intake alone is not to be relied upon as the *total* osteoporosis prevention or reversal program, an abundant calcium intake should be part of everyone’s diet. Aiming for a calcium intake of around 700 mg to 1,000 mg a day is a good idea.

Until the last 50 years, our diets contained far more whole fruits and vegetables, and thus significantly more calcium, than we consume today. Unless you eat several helpings of dark green leafy vegetables and a cup of nuts or seeds daily—not impossible, just uncommon—you might be wise to consider including in the daily diet calcium-fortified soy milk or rice milk to boost your total calcium

intake to the 700 mg/day range.

Remember, however, that you cannot prevent or reverse osteoporosis just by swallowing calcium supplements. Excessive amounts of calcium can lead to precipitation of calcium-containing kidney stones as well as calcium deposits in muscles, tendons, arteries, and other vital tissues. Osteoporosis is a disease of the active dissolution of bone structure, and the entire process must be reversed and bone rebuilt.

As important as it is for us to avoid “calcium thieves,” there are several additional nutritional components for bone health that must be consumed in order to prevent or reverse osteoporosis. These nutrients include vitamin K; vitamin B6; and the earth elements manganese, copper, zinc, boron, and

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silicon. These nutrients are all present in whole, plant-based foods, such as dark green leafy vegetables, root vegetables, nuts, seeds, grains, sea vegetables (nori, arame, wakame, etc.), and fruits. Colorful salads and hearty vegetable dishes are medicine for your bones!

Vitamin D is essential for us to absorb calcium from our food into our bloodstream. Vitamin D is made naturally in our skin as sunlight falls upon it. Fifteen minutes per day of gentle sunlight on the skin of the arms is all that is required. If such sun exposure is unavailable or impractical, an oral vitamin D supplement providing 2,000 IU of vitamin D might be considered.

To Summarize

Because bone building is constantly in progress, bones—even osteoporotic ones—can be helped to make themselves stronger. A basic bone-building plan should utilize all of the modalities below:

1. Eliminate all “calcium thieves,” especially excess sugar, cigarette smoke, and phosphoric acid-containing cola drinks.
2. Be sure your intake of calcium and magnesium is in the 700 mg to 1,000 mg range of each daily.
3. Assure an adequate intake of other trace minerals, especially boron, manganese, chromium, copper, zinc, and silicon, by eating fresh vegetables in soups, salads, steamed vegetables, etc.
4. Institute a regular program of weight-bearing activity, possibly including exercise with elastic resistance bands.
5. If you are a postmenopausal woman, consult with your physician about the role of hormone replacement, especially natural progesterone. A young, lean, athletic woman whose menstrual periods have stopped may be at risk for osteoporosis due to excessively low hormone levels. In her pursuit of a low-fat diet, she may be ingesting so little fat that she cannot make adequate levels of progesterone and other bone-protecting hormones. For that reason, she would be wise to modestly increase the amount of fat in her diet via

WHOLE PLANT-BASED FOODS NOURISH HEALTHY BONES!



ingesting a handful of walnuts and 1/2 avocado every other day. Such a small amount of fat will not result in significant weight gain, but can be instrumental in maintaining healthy bones and other hormone-dependent organs.

In Conclusion

If this common-sense approach to building and maintaining bone strength is diligently practiced, we can look forward to enjoying strong bones that will

serve us well throughout a long, active, and healthy life.

If people want to learn more about keeping their bones strong and healthy, see “Healthy Bones” at <https://vimeo.com/ondemand/healthybones>.

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Michael A. Klaper, M.D., is a graduate of the University of Illinois College of Medicine in Chicago. He received post-graduate training in internal medicine, surgery, anesthesiology, and orthopedics at University of British Columbia teaching hospitals in Vancouver and in obstetrics at the University of California at San Francisco. He has practiced acute care medicine in Hawaii, Canada, California, Florida, and New Zealand and for the past 35 years has been focusing on using health-promoting food and lifestyle choices to help prevent the need for hospitalization and surgery. A long-time radio host and a pilot, Dr. Klaper has served as nutrition advisor to NASA's programs for space colonists on the Moon and Mars. He makes the latest information on health and nutrition available through his website, DoctorKlaper.com, where visitors can find the latest nutrition information through his numerous articles and videos; subscribe to his free newsletter, *Medicine Capsule*; and support his Moving Medicine Forward initiative to get applied nutrition taught in medical schools.